

# **GLOBAL PRECIPITATION MEASUREMENT PRECIPITATION PROCESSING SYSTEM**

## **File Specification 3GPROF**

**Preliminary Version**

September 3, 2014

## 0.1 3GPROF - GPROF Profiling

3GPROF, "GPROF Profiling", produces global  $0.25^{\circ} \times 0.25^{\circ}$  gridded means using Level 2 Gprof data. Vertical hydrometeor profiles and surface rainfall means are computed. Various pixel counts are also reported. The PI is Joyce Chou. The product can be monthly or daily. The following sections describe the structure and contents of the format.

Dimension definitions:

|        |      |   |
|--------|------|---|
| nlat   | 720  | Number of $0.25^{\circ}$ grid intervals of latitude from $90^{\circ}\text{N}$ to $90^{\circ}\text{S}$ .   |
| nlon   | 1440 | Number of $0.25^{\circ}$ grid intervals of longitude from $180^{\circ}\text{W}$ to $180^{\circ}\text{E}$ .  |
| nlayer | 28   | Number of profiling layers. The top of each layer is 0.5, 1.0, 1.5, ..., 9.5, 10.0, 11.0, ..., 18.0 km. The layer tops are heights above the earth's surface. |

Figure 1 through Figure 2 show the structure of this product. The text below describes the contents of objects in the structure, the C Structure Header File and the Fortran Structure Header File.

### **FileHeader** (Metadata):

FileHeader contains general metadata. This group appears in all data products. See Metadata for GPM Products for details.

### **InputFileNames** (Metadata):

InputFileNames contains a list of input file names for this granule. See Metadata for GPM Products for details.

### **InputAlgorithmVersions** (Metadata):

InputAlgorithmVersions contains a list of input algorithm versions for this granule. See Metadata for GPM Products for details.

### **InputGenerationDateTimes** (Metadata):

InputGenerationDateTimes contains a list of input generation datetimes. See Metadata for GPM Products for details.

### **FileInfo** (Metadata):

FileInfo contains metadata used by the PPS I/O Toolkit (TKIO). This group appears in all data products. See Metadata for GPM Products for details.

## Grid (Grid)

### **GridHeader** (Metadata):

GridHeader contains metadata defining the grids in the grid structure. See Metadata for GPM Products for details.

### **surfacePrecipitation** (4-byte float, array size: nlat x nlon):

The monthly mean of the instantaneous precipitation rate at the surface for each grid.

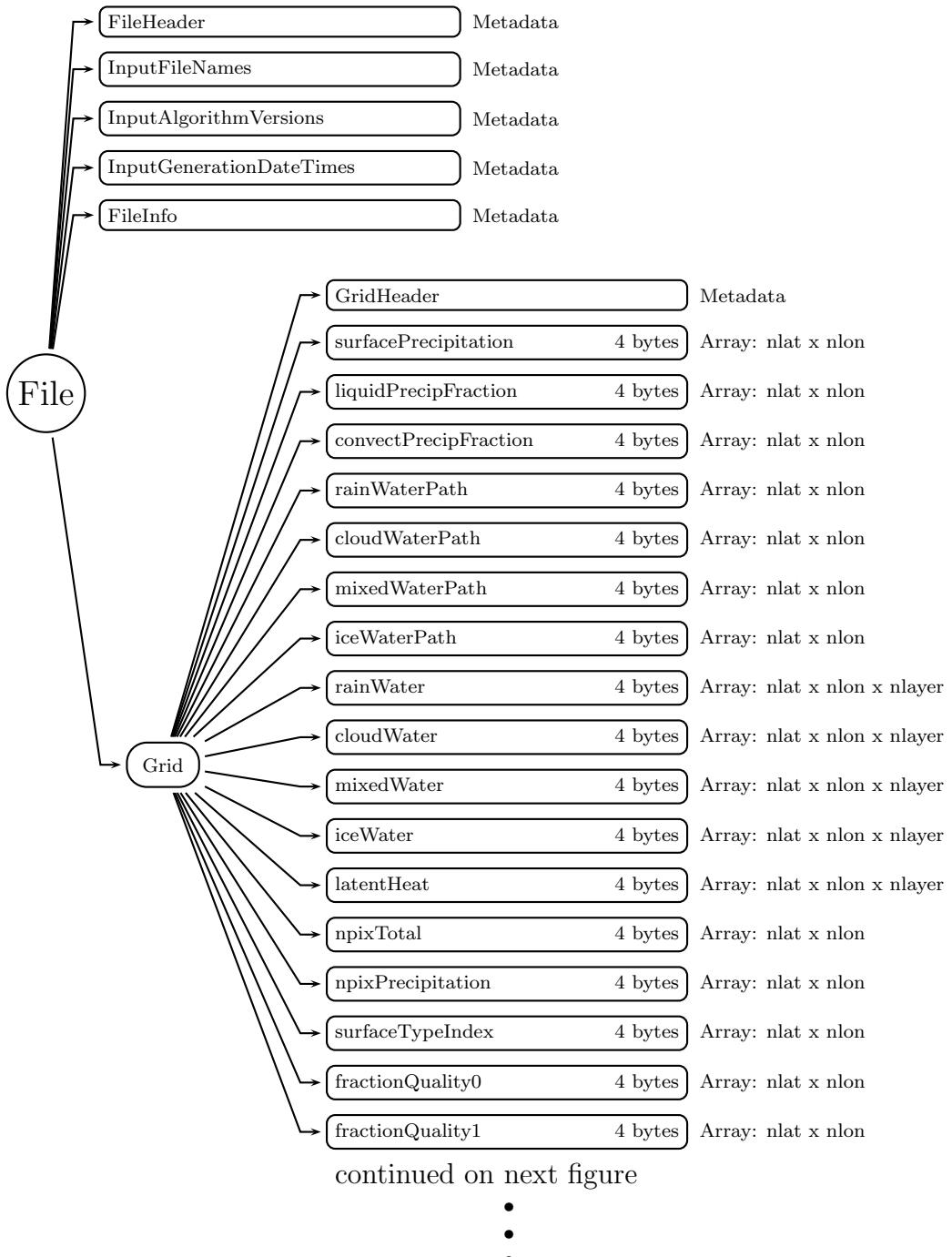


Figure 1: Data Format Structure for 3GPROF, GPROF Profiling

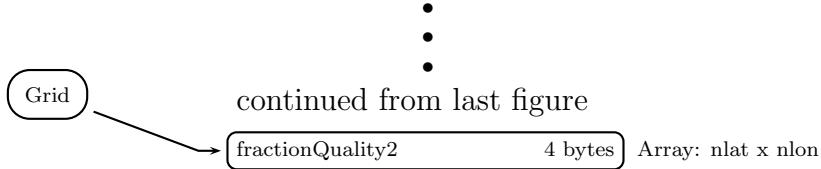


Figure 2: Data Format Structure for 3GPROF, GPROF Profiling

Values range from 0 to 3000 mm/hr. Special values are defined as:

-9999.9 Missing value

**liquidPrecipFraction** (4-byte float, array size: nlat x nlon):

The fraction of the total surface precipitation over the accumulation period that is liquid (i.e. rain). Over the tropics this will typically be one, while over higher latitudes where frozen precipitation is more prevalent it will vary from zero to one. Values range from 0 to 1. Special values are defined as:

-9999.9 Missing value

**convectPrecipFraction** (4-byte float, array size: nlat x nlon):

The fraction of the total surface precipitation over the accumulation period from pixels identified as convective. Values range from 0 to 1. Special values are defined as:

-9999.9 Missing value

**rainWaterPath** (4-byte float, array size: nlat x nlon):

The monthly mean of the total integrated rain water in the vertical atmospheric column. Values range from 0 to 3000 kg/m<sup>2</sup>. Special values are defined as:

-9999.9 Missing value

**cloudWaterPath** (4-byte float, array size: nlat x nlon):

The monthly mean of the total integrated cloud water in the vertical atmospheric column. Values range from 0 to 3000 kg/m<sup>2</sup>. Special values are defined as:

-9999.9 Missing value

**mixedWaterPath** (4-byte float, array size: nlat x nlon):

The monthly mean of the total integrated mixed phase water in the vertical atmospheric column. Values range from 0 to 3000 kg/m<sup>2</sup>. Special values are defined as:

-9999.9 Missing value

**iceWaterPath** (4-byte float, array size: nlat x nlon):

The monthly mean of the total integrated ice water in the vertical atmospheric column. Values range from 0 to 3000 kg/m<sup>2</sup>. Special values are defined as:

-9999.9 Missing value

**rainWater** (4-byte float, array size: nlat x nlon x nlayer):

The monthly mean of the rain water content for each grid at each vertical layer. Values range from 0 to 10 g/m<sup>3</sup>. Special values are defined as:

-9999.9 Missing value

**cloudWater** (4-byte float, array size: nlat x nlon x nlayer):

The monthly mean of the cloud liquid water content for each grid at each vertical layer.

Values range from 0 to 10  $g/m^3$ . Special values are defined as:

-9999.9 Missing value

**mixedWater** (4-byte float, array size: nlat x nlon x nlayer):

The monthly mean of the mixed precipitation liquid water content for each grid at each vertical layer. Values range from 0 to 10  $g/m^3$ . Special values are defined as:

-9999.9 Missing value

**iceWater** (4-byte float, array size: nlat x nlon x nlayer):

The monthly mean of the precipitation ice liquid water content for each grid at each vertical layer. Values range from 0 to 10  $g/m^3$ . Special values are defined as:

-9999.9 Missing value

**latentHeat** (4-byte float, array size: nlat x nlon x nlayer):

The monthly mean of the latent heating release for each grid at each vertical layer. Values range from -256 to 256 C/hr. Special values are defined as:

-9999.9 Missing value

**npixTotal** (4-byte integer, array size: nlat x nlon):

The monthly number of pixels with pixelStatus equal to zero for each grid. The major effect of the pixelStatus requirement is to remove sea ice. npixTotal is used to compute the monthly means described above. Values range from 0 to 10000. Special values are defined as:

-9999 Missing value

**npixPrecipitation** (4-byte integer, array size: nlat x nlon):

The monthly number of pixels with surfacePrecipitation greater than 0 for each grid. For ocean, a pixel is also required to have probabilityOfPrecip greater than 50 percent. Values range from 0 to 10000. Special values are defined as:

-9999 Missing value

**surfaceTypeIndex** (4-byte integer, array size: nlat x nlon):

Indicates the type of surface (Range 0 - 99).

```
Codes include
1 : Ocean
2 : Sea-Ice
(3-12 are 'land classification')
3 : Maximum Vegetation
4 : High Vegetation
5 : Moderate Vegetation
6 : Low Vegetation
7 : Minimal Vegetation
8 : Maximum Snow
9 : Moderate Snow
10 : Low Snow
11 : Minimal Snow
12 : Standing Water and Rivers
```

```

13 : Water/Land Coast Boundary
14 : Water/Ice Boundary
15 : Land/Ice Boundary
60 : Multiple surface types
-99 : Missing value

```

**fractionQuality0** (4-byte float, array size: nlat x nlon):

The fraction of the retrieved pixels in a given grid box identified as good retrievals. For regions where there are no retrieval issues this will be 1.0. Areas with surface screening or contamination issues with questionable retrievals during the accumulation period will have values less than one and should thus be used with caution for any quantitative analysis. Values range from 0 to 1 percent. Special values are defined as:

-9999.9 Missing value

**fractionQuality1** (4-byte float, array size: nlat x nlon):

The fraction of total pixels with qualityFlag equal to 1 (medium quality) for each grid. Values range from 0 to 1 percent. Special values are defined as:

-9999.9 Missing value

**fractionQuality2** (4-byte float, array size: nlat x nlon):

The fraction of total pixels with qualityFlag equal to 2 (low quality) for each grid. Values range from 0 to 1 percent. Special values are defined as:

-9999.9 Missing value

## C Structure Header file:

```

#ifndef _TK_3GPROF_H_
#define _TK_3GPROF_H_

#ifndef _L3GPROF_GRID_
#define _L3GPROF_GRID_

typedef struct {
    float surfacePrecipitation[1440][720];
    float liquidPrecipFraction[1440][720];
    float convectPrecipFraction[1440][720];
    float rainWaterPath[1440][720];
    float cloudWaterPath[1440][720];
    float mixedWaterPath[1440][720];
    float iceWaterPath[1440][720];
    float rainWater[28][1440][720];
    float cloudWater[28][1440][720];
    float mixedWater[28][1440][720];
    float iceWater[28][1440][720];
    float latentHeat[28][1440][720];
}

```

```

    int npixTotal[1440][720];
    int npixPrecipitation[1440][720];
    int surfaceTypeIndex[1440][720];
    float fractionQuality0[1440][720];
    float fractionQuality1[1440][720];
    float fractionQuality2[1440][720];
} L3GPROF_GRID;

#endif

#endif

```

## Fortran Structure Header file:

```

STRUCTURE /L3GPROF_GRID/
  REAL*4 surfacePrecipitation(720,1440)
  REAL*4 liquidPrecipFraction(720,1440)
  REAL*4 convectPrecipFraction(720,1440)
  REAL*4 rainWaterPath(720,1440)
  REAL*4 cloudWaterPath(720,1440)
  REAL*4 mixedWaterPath(720,1440)
  REAL*4 iceWaterPath(720,1440)
  REAL*4 rainWater(720,1440,28)
  REAL*4 cloudWater(720,1440,28)
  REAL*4 mixedWater(720,1440,28)
  REAL*4 iceWater(720,1440,28)
  REAL*4 latentHeat(720,1440,28)
  INTEGER*4 npixTotal(720,1440)
  INTEGER*4 npixPrecipitation(720,1440)
  INTEGER*4 surfaceTypeIndex(720,1440)
  REAL*4 fractionQuality0(720,1440)
  REAL*4 fractionQuality1(720,1440)
  REAL*4 fractionQuality2(720,1440)
END STRUCTURE

```